

AD No. **23046**
ASTIA FILE COPY

Air Research and Development Command

HUMAN RESOURCES RESEARCH CENTER

**A Study in the Applicability of the Same Minimum
Qualifying Scores for Technical Schools
To White Males, WAF, and Negro Males**

by

Mary Agnes Gordon

Technical Report 53-34

Implications for the Air Force

The Airman Classification Battery makes an important contribution to the effective assignment of enlisted personnel to various technical schools. Moreover, research has indicated that over-all prediction of school grades is essentially the same for white males, Negro males, and WAF's. However, this comparability in terms of over-all prediction does not preclude the possibility that different minimum qualifying scores should be used to assure that, with reference to potential school success, classification of airmen in the three groups is on the same basis.

The findings of this study indicate that the same minimum qualifying scores are applicable in the classification of white and Negro airmen. On the other hand, for assignments to schools in most aptitude clusters, the minimum qualifying score for WAF may be set at a lower point than for male enlisted personnel. The comparisons between the WAF and the male airmen samples indicate that, in general, WAF will achieve higher school grades than will male airmen having the same aptitude index. Various explanations of this finding are discussed in the report.


This study also confirms the findings of previous investigations that the Biographical Inventory BE601B, although contributing somewhat to the classification of white male personnel,

adds very little to the efficiency of the Airman Classification Battery in the classification of WAF and Negro males. Improvement of this particular test is indicated.

This Technical Report will be of interest to personnel concerned with classification policies and procedures



Arthur W. Melton
Technical Director



Herbert N. Cowles
Col, USAF
Commander

Headquarters
Human Resources Research Center
Lackland Air Force Base
San Antonio, Texas
1 November 1953

Table of Contents

	Page
List of Tables.....	v
List of Figures	v
Problem	1
Background	1
Description of Predictor and Criterion Variables	1
Technical School Samples.....	1
Method	2
Results.....	6
Analysis of Regressions on Aptitude Indexes.....	6
Analysis of Regressions on Biographical Inventory BE601B	9
Summary and Recommendations	12
References.....	13
Appendix: Basic Statistics Used in the Study of the Prediction of Final School Grades in Selected Air Force Technical Schools from Test Scores of White Males, White WAF, and Negro Males.....	15
Table 4: Clerk-Typist School, 40500, First Sample	15
Table 5: Supply Technician School, 82600.....	16
Table 6: Teletype Operator School, 23700, First Sample.....	17
Table 7: Radio Operator School, 76601	18
Table 8: Radar Operator School, 51400.....	19
Table 9: Radio Mechanic School, 75401	20
Table 10: Weather Observer School, 78400.....	21
Table 11: Clerk-Typist School, 40500, Second Sample.....	22
Table 12: Teletype Operator School, 23700, Second Sample	23
Table 13: Photo Laboratory Technician School, 23250	24
Table 14: Airplane and Engine Mechanic School, 43151	25

List of Tables

Table	Page
1 Differences in Final School Grades, Predicted from Minimum and Maximum Aptitude Indexes, of the White WAF and Negro Male Groups from the White Male Group.....	6
2 Technical School Samples in Which Significant Differences Between Groups Were Found	7
3 Differences in Final School Grades, Predicted from Low and High Biographical Inventory BE601B Scores, of the White WAF and Negro Male Groups from the White Male Group	9

List of Figures

Figure	Page
1 Two groups illustrating identical regressions and three ways in which regressions may differ.....	3
2 Regressions of final school grade on aptitude index for eleven technical schools	4
3 Regressions of final school grade on biographical inventory score for nine technical schools	10

A Study in the Applicability of the Same Minimum Qualifying Scores for Technical Schools to White Males, WAF, and Negro Males

Problem

The Airman Classification Battery AC-1 was standardized on white male basic airmen. It was assumed that no serious errors of classification would be made in assigning Women in the Air Force (WAF) and Negroes to technical schools if the same minimum qualifying scores were used for all. It is the purpose of this study to investigate the validity of this assumption.

Background

Howard and Pickrel (2, 3, 4) have shown that, in spite of differences between white males and WAF in means and standard deviations on the tests, the Airman Classification Battery AC-1 predicts academic success almost as well for WAF as it does for white males. The validity of the battery is lower for Negro males, although, in general, the most valid predictors are the same for white and Negro males. Howard and Pickrel also found very similar factor patterns among the three groups. The greatest difference was in loadings on the mechanical factor which were slightly lower for Negro males and considerably lower for WAF. Howard and Pickrel's validity findings apply mainly to success in clerical, technician specialty, and radio operator schools. No large scale study was made in the mechanical field, where the greatest sex differences would be expected, because of lack of data on WAF. Howard and Pickrel did, however, include a study of the Radio Mechanic School.

The validity studies of Howard and Pickrel have some bearing on the problem of the appropriateness of using, for the WAF and Negro males, the same minimum qualifying scores that were established for white males. The statistical test to be applied here is a more sensitive one than that employed in the previous studies in that it involves, not the similarity of the validity coefficients, but the similarity of the regressions. In other words, the question is whether white males, WAF, and Negro males with the same aptitude index may be expected to achieve the same final school grade. If not, then consideration of the possible need for different qualifying scores would be appropriate.

Description of Predictor and Criterion Variables

Airman Classification Battery AC-1. The Airman Classification Battery AC-1 is composed of 13 tests and seven empirically derived Biographical Inventory BE601B(BI) keys. Eight different aptitude indexes are computed for each person by weighting tests and biographical inventory scores for prediction of success in eight different occupational fields. All raw scores are converted to Air Force normalized standard scores which range from one to nine. A minimum qualifying aptitude index of five was used for assignment to the technical schools included in this study.

Final School Grade. The final school grade attained upon the completion of a course is a weighted composite of grades on the various phases of the course. Passing grades range from 2.5 to 5.0. Eliminees are not included in the computation of validity coefficients.

Education. The number of years of education is taken from the entry of the basic airman on his record card. The usefulness of this variable may be affected by possible misstatements and by unequal quality of educational training. Graduation from high school was required of WAF for entrance to the Air Force.

Technical School Samples

Eleven technical school samples of white males, WAF, and Negro males are included in the study. Seven of these samples were the same as those used in the Howard and Pickrel studies (2, 4). Three of these groups were assigned to the technical schools for Clerk-Typist, Supply Technician, and Teletype Operator on the basis of their Clerical Aptitude Indexes; two to Radio Operator and Radar Operator Schools on the basis of their Radio Operator Aptitude Indexes; one to Radio Mechanic School on the basis of Mechanical Aptitude Indexes; and one to Weather Observer School on the basis of Technician Specialty Aptitude Indexes. The dates of testing (which occurred during basic training before assignment to technical school) for the white male groups in these studies ranged from November 1948 to December

1949, while the dates for the WAF and Negro males extended to November 1950.

Four more recent technical school samples with testing dates ranging from December 1949 to November 1950 were included. In two of these, Clerk-Typist and Teletype Operator, the WAF and Negro male samples overlapped the original samples, but the white male group was entirely distinct. The Photographic Laboratory Technician sample was assigned on the basis of Technician Specialty Aptitude Index, and the Airplane and Engine Mechanic sample on the basis of Mechanical Aptitude Index.

In the study by Howard and Pickrel the WAF samples included both whites and Negroes. In the present study the WAF groups are limited to white. There were so few Negro WAF in each sample—a maximum of 19 in the Clerk-Typist group—that they could not be included as a fourth group in the analysis.

Method

The regression of final school grade on aptitude index was compared for different groups by the method described by Gulliksen and Wilks (1). This method is the large sample analogue of the small sample method of analysis of covariance described by Snedecor (6).

Given the aptitude indexes and final school grades of a group of students, a regression equation may be computed from which predictions can be made of the grades expected of future students with given aptitude scores. Two groups of students may have different means and standard deviations on the predictor and criterion variables and yet have the same regression line. This is illustrated in Figure 1a. The center of each ellipse indicates the mean aptitude score and the mean final school grade for the group. The width of the ellipse shows the range of aptitude scores between plus and minus one standard deviation, and the height of the ellipse shows the range of final school grades within plus and minus one standard error of estimate. It can be seen from this figure that, for any given aptitude index, the predicted final school grade is the same for either group.

Figure 1b illustrates the case in which the two groups have parallel regression lines on different levels, i.e., the *intercepts* are different. In this

case, for any given aptitude score the predicted final school grade of one group is higher than that for the other group by a constant amount over the range of aptitude indexes. It follows that the same minimum qualifying score is not appropriate for these groups.

Figure 1c illustrates a second type of difference in which the regression lines are not parallel, i.e., the *slopes* are different. For a high aptitude score the predicted grade is higher for the right-hand group, but for a low aptitude score the predicted grade is higher for the group on the left. Further study is indicated in such cases to determine the point on the aptitude score scale at which the difference becomes significant.

A third type of difference is illustrated in Figure 1d. The groups differ with respect to the standard error of estimate as shown by the different heights of the two ellipses. If this variance around the regression line differs, it is apparent at the outset that the groups do not belong to the same regression system and it is somewhat futile to go on to see whether the regression lines have equal slopes and intercepts.

The computational procedure as well as the theory reverses the order named above. As in any analysis of variance, the homogeneity of variance is the first hypothesis tested. If this hypothesis is accepted, the next step is to test the hypothesis of equal slopes. If the first two hypotheses are accepted, then the hypothesis of equal intercepts can be tested. Figure 1d illustrates the situation in which the hypothesis that the errors of estimate are the same in both groups is false; Figure 1c illustrates a false hypothesis regarding equality of the slopes of the regression lines; Figure 1b illustrates a false hypothesis of equal intercepts; and Figure 1a illustrates the situation in which all three hypotheses are true.

Analyses were made of differences between white males and Negro males and between white males and white WAF. The first analysis compared regressions of the criterion on the aptitude index upon which selection for a specific technical school was based. Education was then combined, as a second predictor, with the aptitude index in order to see whether regression differences among the groups could be accounted for by differences in educational level. Regressions on the two tests which appeared to provide the best prediction of final school grade were then analysed. The pos-

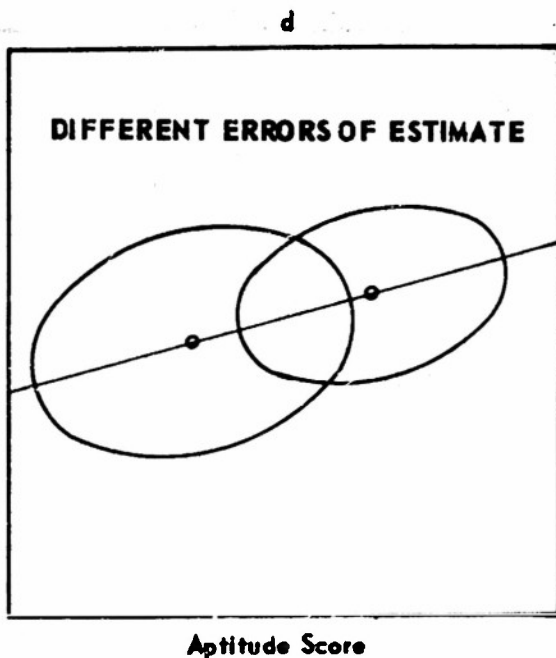
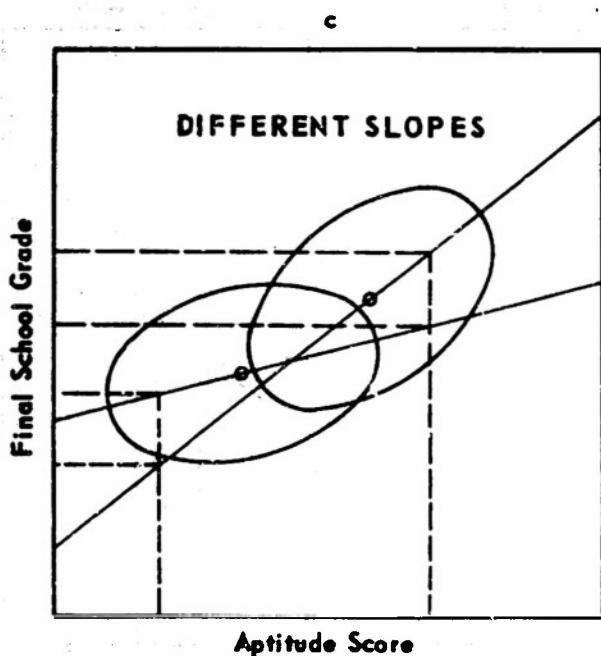
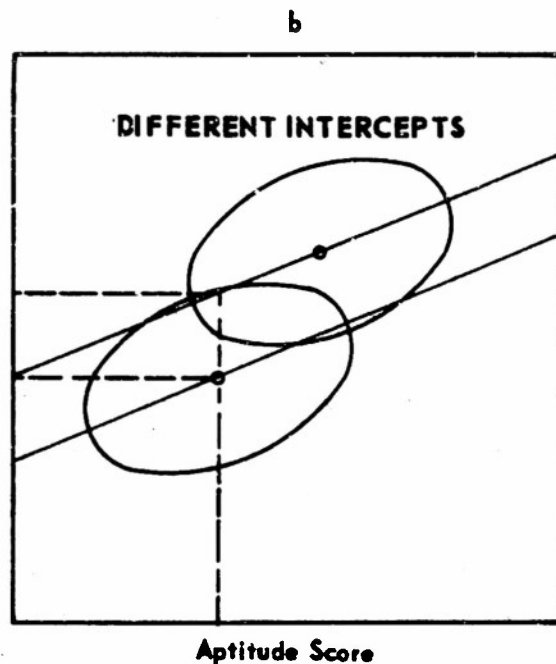
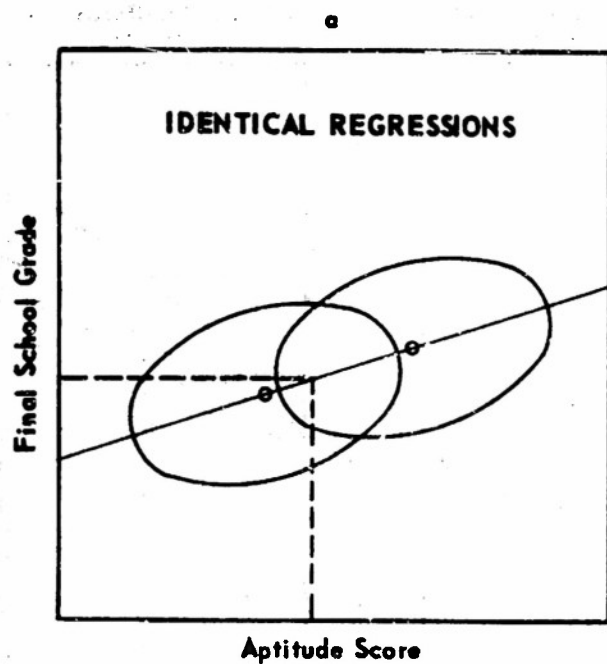


Fig. 1. Two groups illustrating identical regressions and three ways in which regressions may differ. The \circ shows the mean aptitude score and the mean final school grade. Elliptical contours show the range of scores between plus and minus one standard deviation (horizontal) and range of final school grades between plus and minus one standard error of estimate (vertical). Dotted lines show the final school grade predicted from a given aptitude score.

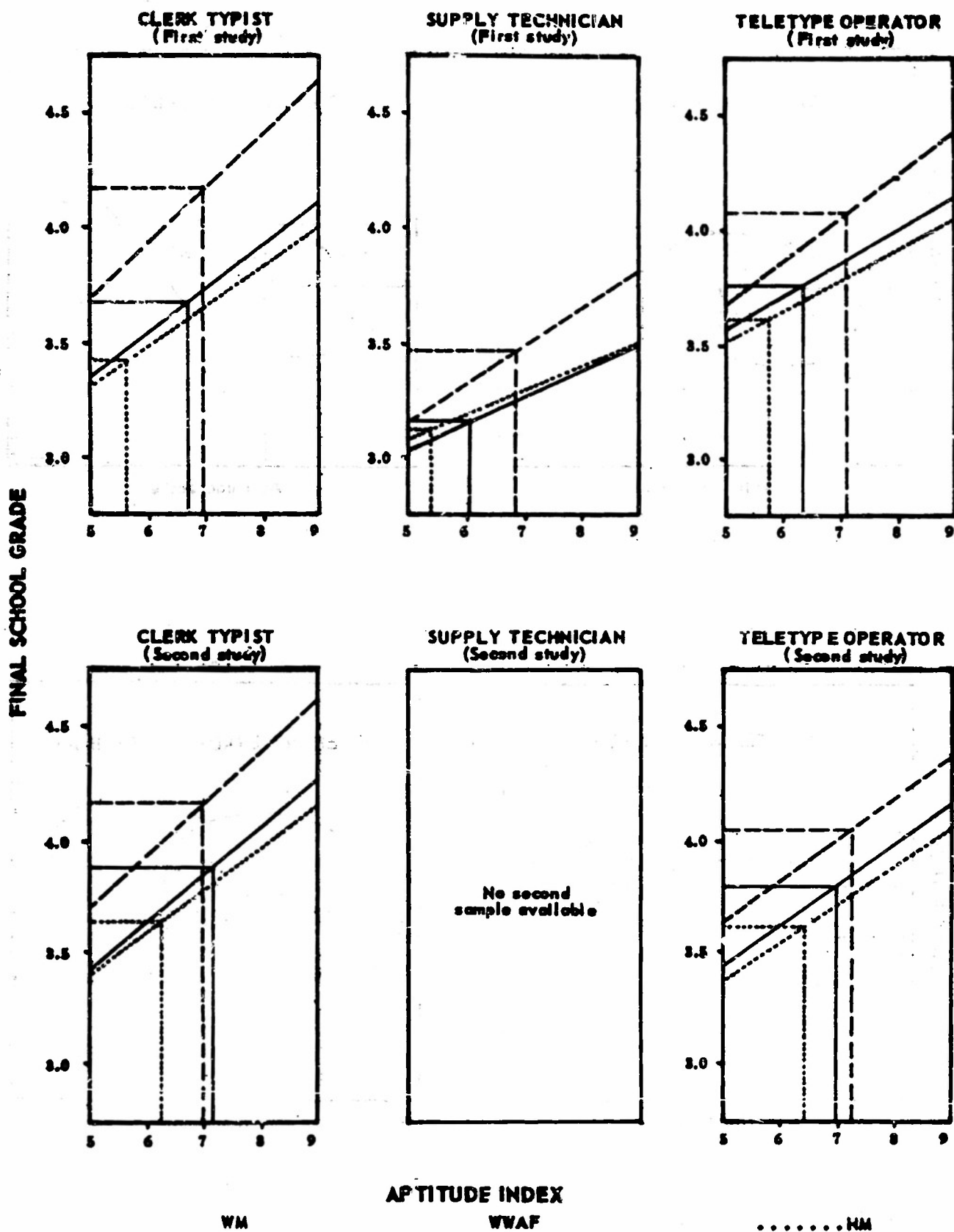
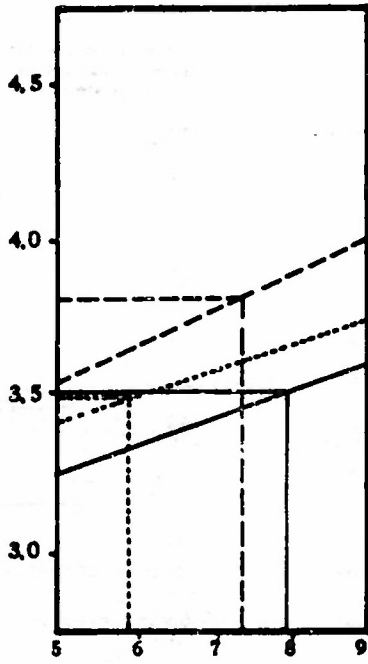


Fig. 2. Regressions of final school grade of aptitude index for eleven technical schools.

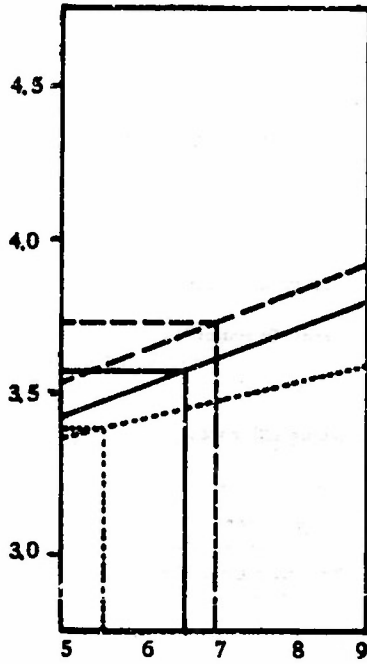
Fig. 2 (Cont.)

FINAL SCHOOL GRADE

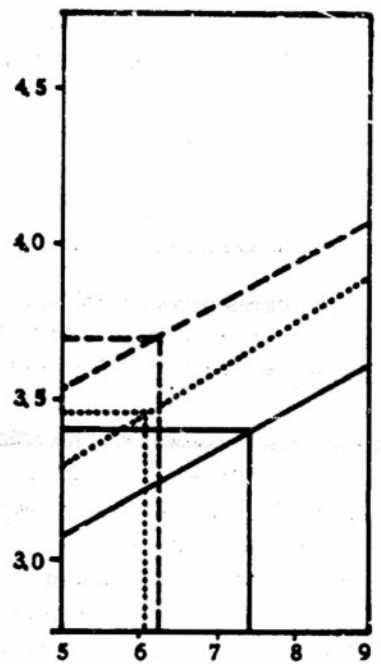
RADIO OPERATOR



RADAR OPERATOR



RADIO MECHANIC



WEATHER OBSERVER

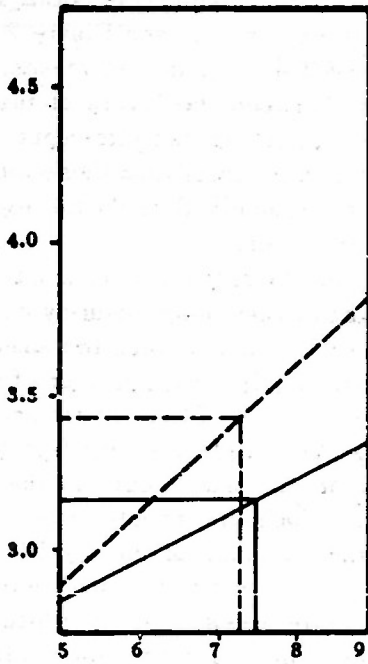
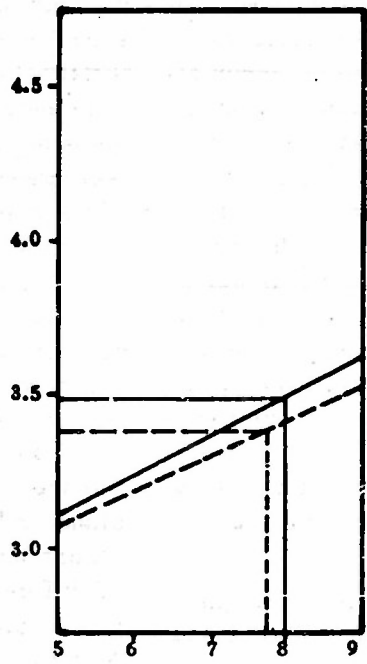
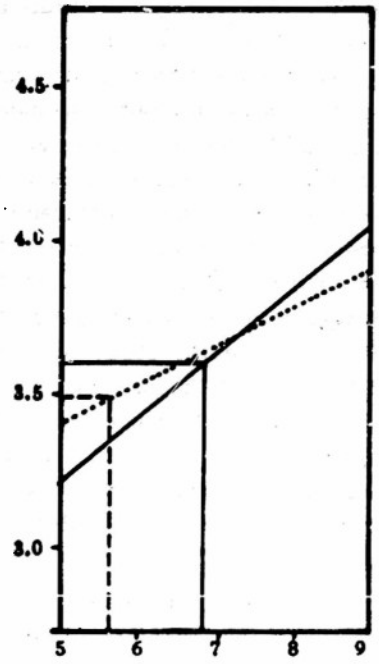


PHOTO LAB TECHNICIAN



A&E MECHANIC



APTITUDE INDEX

——— WM

----- WMAF

..... NM

sible effect of additional predictor variables was considered at this point. Finally regressions on the Biographical Inventory BE601B scores were analysed.

Table 1

Differences in Final School Grades, Predicted from Minimum And Maximum Aptitude Indexes, of the White WAF And Negro Male Groups from the White Male Group

Results	Technical school	Aptitude index	Difference from white male predicted final school grade in grade units	
			W WAF	NM
Analysis of Regressions On Aptitude Indexes	Clerk-Typist	5	.32	-.04
		9	.56	-.09
	Supply Technician	5	.14	.06
		9	.32	.00
	Teletype Operator	5	.11	-.06
		9	.22	-.09
	Radio Operator	5	.30	.15
		9	.39	.16
	Radar Operator	5	.09	-.05
		9	.09	-.16
	Radio Mechanic	5	.42	.19
		9	.46	.28
	Weather Observer	5	.05	--
		9	.40	--
	Clerk-Typist (second sample)	5	.24	-.06
		9	.38	-.17
	Teletype Operator (second sample)	5	.24	-.04
		9	.21	-.11
	Photo Laboratory Technician	5	-.05	--
		9	-.07	--
	A&E Mechanic	5	--	.14
		9	--	-.11

The regression of final school grade on the aptitude index is shown graphically in Figure 2 for each group in each of the 11 technical school samples. The mean aptitude indexes and the mean grades of each group are shown by the vertical and horizontal lines connecting the regression line with the two axes. Supporting data for these graphs may be found in Tables 4 through 14 (in the Appendix).

The extent and direction of group differences are shown in Table 1. Final school grades predicted from (a) an aptitude index of five (the minimum qualifying aptitude index for assignment to technical school) and (b) an aptitude index of nine (the maximum aptitude index) were computed. The difference between these predicted grades of WAF and Negro males from white males is shown. A positive difference indicates higher predictions for the minority group. The difference is shown in terms of the grade scale unit which ranges from a passing grade of 2.5 to a maximum of 5.0. Since this study is concerned with the applicability of the same minimum requirements for all groups, the grades predicted from minimum aptitude indexes are of primary interest. If minimum requirements are to be revised the grades predicted from other aptitude levels will also be of interest.

The results of tests of the statistical significance of the differences shown in Figure 2 and Table 1 are presented in Table 2. Results are stated in terms of the acceptance of hypotheses or their rejection at the .01 level of significance.

Regression on Aptitude Index

The regressions of the WAF and Negro male groups differ sufficiently in every technical school

sample from the regression for the white male group to justify the conclusion that the same aptitude index will not predict the same final school grade for these groups (see Figure 2 and the first section of Table 2). In most cases, the difference occurs between the levels of the regression lines, i.e., between the intercepts. The regressions for the WAF differ from those for the white males more frequently than do the regressions for the Negro males.

If differences are considered significant only if they are so large that they could occur by chance not more than one time in 100, then the same regression line fits both male groups in four of nine samples, namely in the two Clerk-Typist and the two Teletype Operator samples. A significant difference in error of estimate occurs in the Airplane and Engine Mechanic sample, which precludes an accurate estimate of the significance of differences in slope and intercept. There are no significant differences between white and Negro males in the slopes of the regression lines. There are, however, significant differences in the grades they get relative to their aptitude indexes (indicated by a difference in intercepts) in the Supply Technician, Radio Operator, Radar Operator, and Radio Mechanic samples. Table 1 shows that, for equal aptitude indexes, the Negroes make better grades than do the white males in three of

Table 2

**Technical School Samples in Which Significant Differences
Between Groups Were Found**

Predictor: Aptitude Index		
White and Negro male		White male and WAF
Errors of estimate	A&E Mechanic	Clerk-Typist (second sample) Photo Lab. Technician Supply Technician
Slopes	-----	
Intercepts	Supply Technician Radio Operator Radar Operator Radio Mechanic	Clerk-Typist (first sample) Teletype Operator (first sample) Radio Operator Radio Mechanic Weather Observer Teletype Operator (second sample)
Predictors: Aptitude Index and Education		
Errors of estimate	A&E Mechanic	Weather Observer Clerk-Typist (second sample)
Slopes	Clerk-Typist (first sample)	Clerk-Typist (first sample) Supply Technician
Intercepts	Supply Technician Radio Operator Radar Operator Radio Mechanic Clerk-Typist (second sample)	Teletype Operator (first sample) Radio Operator Radio Mechanic Teletype Operator (second sample)
Predictors: Two Tests		
Errors of estimate	Clerk-Typist (first sample)	Clerk-Typist (second sample)
Slopes	-----	-----
Intercepts	Radio Mechanic	Clerk-Typist (first sample) Supply Technician Teletype Operator (first sample) Radio Operator Radar Operator Radio Mechanic Weather Observer Teletype Operator (second sample)
Predictor: Biographical Inventory BE601B		
Errors of estimate	Supply Technician	-----
Slopes	-----	-----
Intercepts	Clerk-Typist (first sample) Teletype Operator (first sample) Radar Operator Clerk-Typist (second sample) Teletype Operator (second sample)	All samples

these schools. The difference is largest in the Radio Operator and Radio Mechanic samples. The grade predicted for Negroes from an aptitude index of five is .15 grade points higher than that predicted for white males in the former sample and .19 points higher in the latter sample.

For white males and WAF the regressions are the same at the .01 level in only one sample, the Radar Operator School. Significant differences in errors of estimate occur in the second Clerk-Typist and in the Photo Laboratory Technician samples. A significant difference in slopes occurs in the Supply Technician sample. Significant differences in intercepts occur in the remaining samples. All significant differences in intercepts favor the WAF, as shown in Table 1. A striking difference occurs in the Radio Mechanic School. The grade predicted from an aptitude index of

five is .42 grade points higher for WAF than for white males. The difference is .30 grade points in the Radio Operator School, .32 grade points in the first Clerk-Typist School, and .24 grade points in the second Teletype Operator School. Even larger differences in favor of WAF occur in the grades predicted from an aptitude index of nine. The Photo Laboratory Technician School is the only one in which the difference is slightly in favor of white males.

At the .05 level of significance the slope of the regression for the WAF group differs from that for the white male group in three samples. The difference in slopes is apparent in the graphs and in the differences in predicted grades for indexes of five and nine presented in Table 1. The respective differences are .32 and .56 for the first Clerk-Typist sample, .14 and .32 for Supply Tech-

nician, and .05 and .40 for Weather Observer, in each case the intercept being higher for the WAF groups.¹

Note on Significance.

It may be well at this point to call attention to some unavoidable peculiarities in the composition of the samples. They account for some of the apparent discrepancies between the appearance of the regression lines in the figures and the summary of significant differences in Table 2. These peculiarities involve differences among technical school samples in the total number of cases, in the proportion of the total in minority groups, and in the size of the error of estimate. For a difference of any given magnitude, the larger the number of cases the greater is the likelihood of that difference being significant; the greater the proportion of total cases in a minority group the greater is the likelihood that a given departure of that minority group from average will be significant; and the smaller the error of estimate the greater is the likelihood that a specified difference will prove significant. For example, the relatively large proportion of WAF and Negro males in the Supply Technician School, together with the very small error of estimate favors the findings of differences which, though small in magnitude, are statistically significant.

Regression on Aptitude Index and Education

Because of different requirements for entrance into the Air Force, the average number of years of education is greater for women than for men. This was thought to be a possible reason for the higher grades of WAF who have the same aptitude indexes as white males. Therefore, the multiple regressions of final school grade on aptitude index and education were analyzed. The results are shown in the second section of Table 2. Comparisons of regressions for WAF and white males show only slight alterations in the results that obtained for the aptitude index alone—i.e., the two groups cannot be said to be any more alike when education and aptitude indexes are combined. The addition of education actually increases the differences in regressions between the two male groups.

¹If different minimum aptitude indexes are to be recommended, it is important to determine regions of significant differences between sample regression lines which are non-parallel. Results of an analysis directed at this problem will be reported in a later study.

The number of years of education recorded by the individual may be an inadequate measure of educational differences. One finds, for example, that Negro male groups have a greater average number of years of education but lower average aptitude indexes than do corresponding white male groups. Furthermore, the education variable behaves erratically in the regression equation, frequently assuming zero or negative slopes in one group or another. The results of this part of the analysis must therefore be considered inconclusive.

Regression on Two Tests

From previous multiple correlation studies and from an examination of validity coefficients in the present samples, two tests for each technical school sample were selected which seemed to promise the best prediction for all three groups. No attention was paid in this selection to whether the tests were included in the appropriate aptitude indexes, or whether they appeared a priori to be logical predictors. An attempt was made to avoid selecting any one test repeatedly, but even so Dial and Table Reading BP622A-621A appears in 6 of the 11 samples. The purpose was simply to determine whether any combination of predictors would equalize group differences in regressions.

The results in the third section of Table 2 show only a slight improvement in the white-male and WAF comparisons. The hypothesis of equal intercepts is still rejected for most samples. However, the results show that tests can be selected in such a way that the regressions are similar for white and Negro males in all except two samples.

When a third variable was added to those already selected for the second Clerk-Typist and Teletype Operator samples, the conclusions regarding significantly different regression intercepts were not changed. Further examination of the data showed that there was no combination of predictors for these or other samples that would change this result.

Analysis by Aptitude Clusters

The preceding analysis shows where the important differences between groups exist. Unless the results are consistent from school to school within aptitude clusters, however, adjustments of qualifying scores would be difficult to make.

Consistency of results within clusters will first be examined as a basis for recommendations regarding adjustment of qualifying indexes for WAF. Results are fairly consistent in the two Clerk-Typist, two Teletype Operator, and Supply Technician samples in the Clerical Cluster. Table 1 shows that the grades predicted from an aptitude index of five are consistently higher for WAF than those predicted for white males, and Table 2 shows that three of these differences are significant. If one point is added to the aptitude indexes of WAF (or if their minimum qualifying score is lowered to four), the grades predicted approximate those predicted for white males with an index of five. For specific schools the differences in predicted grade units after this adjustment are: Clerk-Typist, first sample, .08; Supply Technician, -.02; Teletype Operator, first sample, -.05; Clerk-Typist, second sample, .00; Teletype Operator, second sample, .07.

The Radio Operator and Radar Operator samples in the Radio Operator Cluster are not entirely consistent. According to the observed regression equations, three points should be added to indexes of WAF in the former school and one point in the latter named school. The difference between groups in the Radar Operator sample is not significant.

Neither of the two schools, Weather Observer and Photo Laboratory Technician, in the Technician Specialty Cluster, show large differences in the grades predicted for an aptitude index of five. Although there is a significant difference in intercepts for Weather Observer as shown in Table 2, the difference between groups may be significant only at higher aptitude levels (see Table 1).

An adjustment of three score points is indicated for WAF in the Radio Mechanic School, which is the only mechanical school in which there is a WAF group.

The same type of analysis of results for Negro males shows that no adjustment is required in the Clerical Cluster. The differences between the two male groups are small and in four of five schools they favor the white group. In the Radio Operator Cluster the differences are in opposite directions in the two schools. In the Radio Mechanic School the addition of one point to indexes of Negro males might be recommended. However, this course is not truly representative of the Mechanical Cluster. It has since been transferred to the Electronics Cluster. No adjustment is indi-

cated in the Airplane and Engine Mechanic course which is the general fundamentals course in the Mechanical Cluster.

Analysis of Regressions on Biographical Inventory BE601B

Biographical Inventory BE501B (BI) scores constitute one-fifth of the weight in the Clerical, Radio Operator, and Mechanical Aptitude Indexes. The inventory is heavily loaded with items of a mechanical nature which may have a positive weight on one key and a negative weight on another. Most women find it a baffling task because they lack the mechanical experience necessary to express the preferences demanded. Negro males also are probably at a slight disadvantage compared with white males in answering the items of the inventory. In the white male groups the BI keys have appreciable validity, but in the WAF and Negro male groups the validities are hardly distinguishable from zero. Even so the BI Clerical key has consistently higher validity for the WAF and Negro males than have the other two BI scores.

Figure 3 presents the regressions of final school grade on the various BI scores graphically. Table 3 shows differences from white male in the grades

Table 3
Differences in Final School Grades, Predicted from Low and High Biographical Inventory BE601B Scores, Of the White WAF and Negro Male Groups From the White Male Group

Technical school	BI score	Difference from white male predicted final school grade in grade units	
		W WAF	NM
Clerk-Typist	5	.49	-.22
	9	.34	-.34
Supply Technician	5	.28	-.03
	9	.28	-.08
Teletype Operator	5	.21	-.18
	9	.18	-.23
Radio Operator	5	.31	-.05
	9	.34	.07
Radar Operator	5	.12	-.13
	9	.11	-.33
Radio Mechanic	5	.32	.08
	9	.08	-.07
Weather Observer	5 9	No Biographical Inventory	
Clerk-Typist (second sample)	5	.33	-.27
	9	.12	-.35
Teletype Operator (second sample)	5	.22	-.16
	9	.21	-.28
Photo Laboratory Technician	5	No Biographical Inventory	
	9		
A&E Mechanic	5	---	-.09
	9	---	-.32

FINAL SCHOOL GRADE

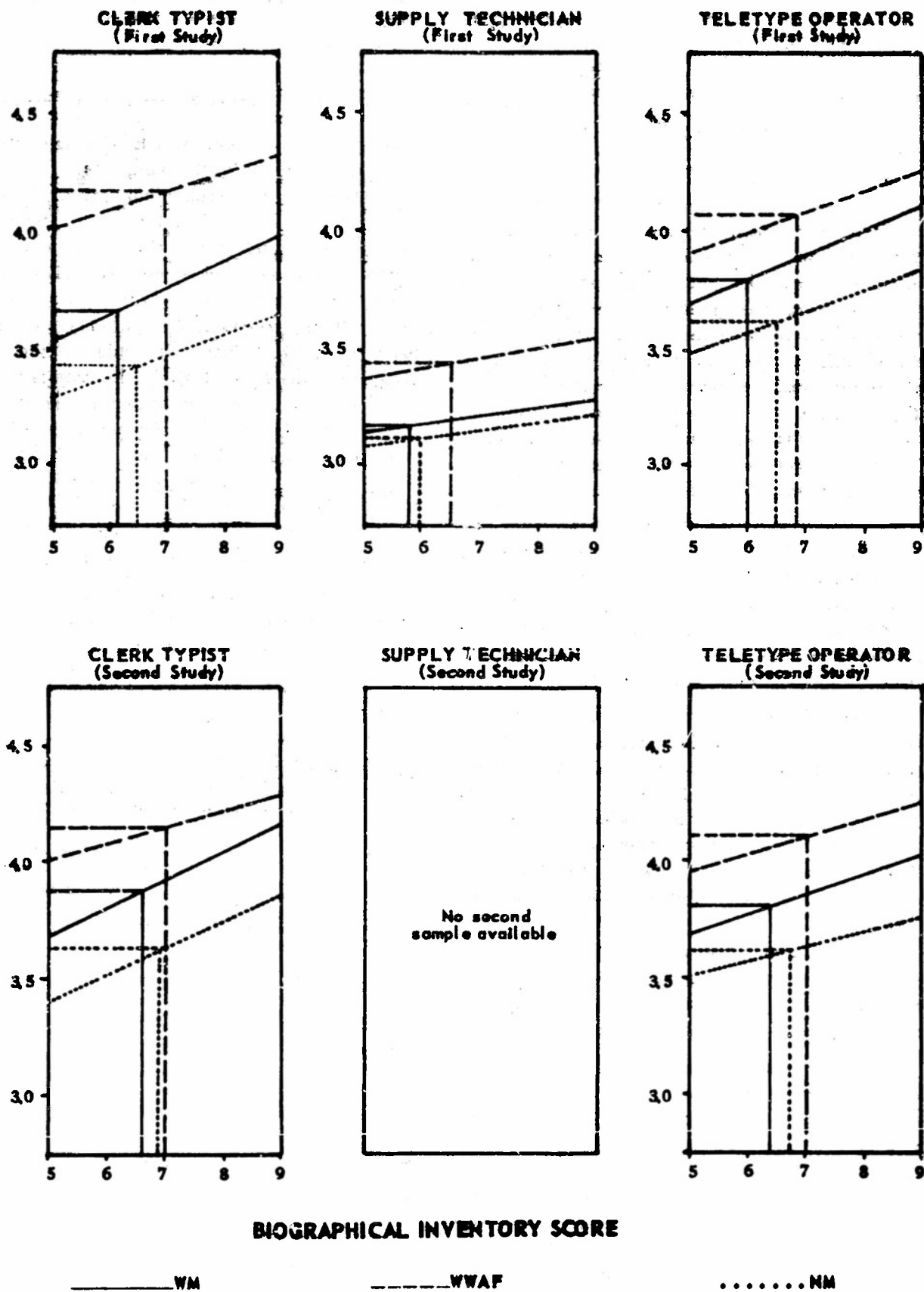
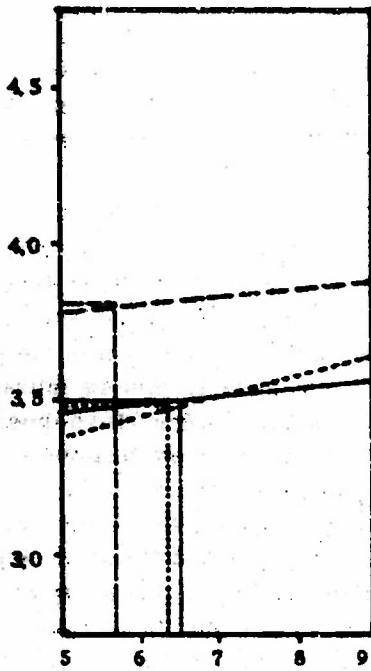


Fig. 3. Regressions of final school grade on biographical inventory score for nine technical schools.

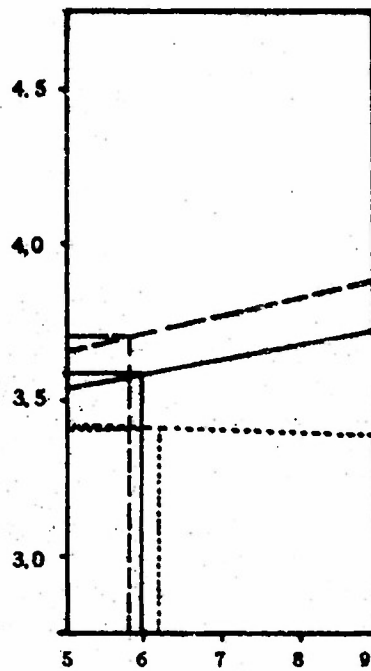
Fig. 3 (Cont.)

FINAL SCHOOL GRADE

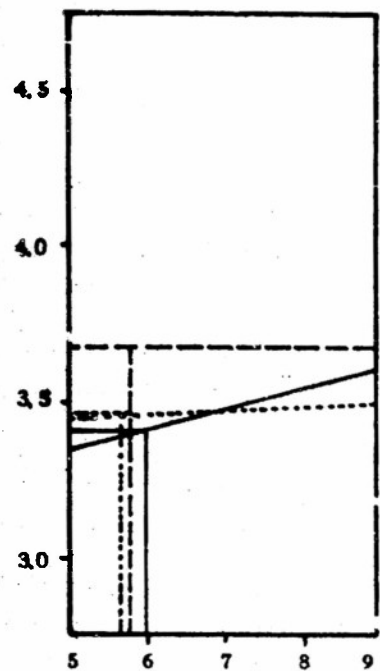
RADIO OPERATOR



RADAR OPERATOR



RADIO MECHANIC



WEATHER OBSERVER

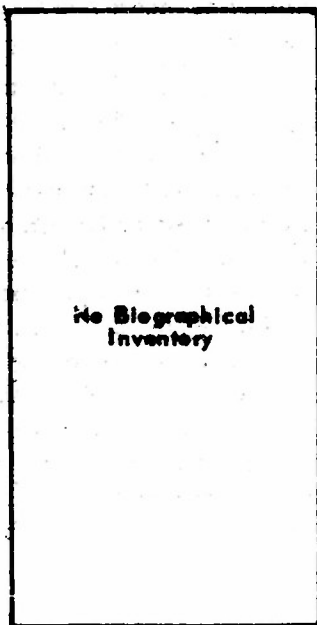
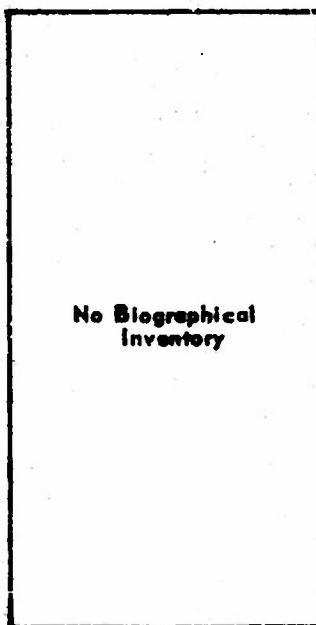
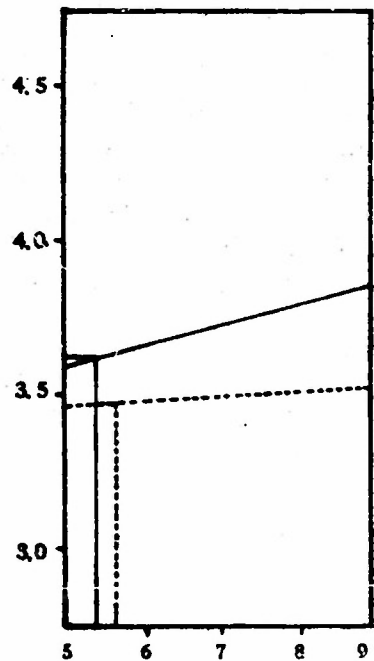


PHOTO LAB TECHNICIAN



A & E MECHANIC



BIOGRAPHICAL INVENTORY SCORE

—— WM

----- WAF

..... NM

predicted from BI scores of five and nine, respectively. Results of tests of significance of differences are shown in the last section of Table 2. As with other predictors there is greater agreement between the race groups than between the sexes. The usual difference in intercepts prevails between white males and WAF.

The results for Negro males suggest a partial explanation of the racial differences in regressions on aptitude indexes. Their Clerical key Biographical Inventory scores, for instance, indicate that their background is more favorable than that of white males for success in the clerical field, whereas their aptitude indexes show that they are not as well qualified. The Biographical Inventory score therefore inflates the composite aptitude index for Negroes. This accounts for the low level of the Negro regression lines on the Clerical Aptitude Index and for the negative differences in Table 1. It may be noted that there is little difference between races in grades predicted from Biographical Inventory scores in Radio Operator and Radio Mechanic Schools. These are the two schools in which grades predicted from the aptitude index were most favorable for Negro males.

Summary and Recommendations

This study investigates the question of whether white males, WAF, and Negro males can be expected to attain the same average final school grade in technical schools when they have the same aptitude index. Differences among the groups in aptitude indexes are taken into account by an analysis of covariance. Eleven samples of validation data from the Clerical, Radio Operator, Technician Specialty, and Mechanical Aptitude Clusters were analyzed. The results of the study indicate whether the classification of these three groups on the basis of the same minimum qualifying aptitude indexes is justifiable.

The findings justify the use of the same minimum aptitude indexes for white and Negro male airmen. Differences between the white males and WAF, however, are large enough to warrant a consideration of different qualifying scores in certain aptitude clusters. If a minimum aptitude index of five is required of white males, then the following minimum indexes for WAF could be recommended:

1. An aptitude index of four for schools in the Clerical Cluster.

2. An aptitude index of four for schools in the Radio Operator Cluster.

3. An aptitude index of five for schools in the Technician Specialty Cluster.

4. An aptitude index of two for schools in the Mechanical Cluster is indicated by results based on one school. This is not considered an adequate sampling, however, and probably no recommendation is justified in this area.

This study confirms the finding of previous studies that the Biographical Inventory BE601B has poor predictive value for WAF and Negro males. It is recommended that attention be paid to the responses of these groups in future revisions of the inventory. It might also be possible to remove regression differences from other tests as well, but the changes that need to be made on aptitude tests to accomplish this objective are not as obvious. The effect of deliberately injecting aviation content into test items, which was done to stimulate interest and to give the tests face validity, might be investigated.

The reasons for the superior grades of WAF when their aptitude indexes equal those of white males are of considerable interest. The hypothesis that the greater number of years of education of WAF was a contributing factor was investigated in this study but with inconclusive results.

One plausible explanation is that the Airman Classification Battery has a cultural bias. The WAF are thus at a disadvantage on the aptitude measures, but they have an opportunity to make up for this during the period of learning in the training course. The sample in which the greatest difference in regressions between men and women occurred is the Radio Mechanic School, the aptitude index for which puts women at the greatest disadvantage. This seems to be a general principle which applies as well to comparisons of other population subgroups. The same principle, for example, has been found useful in explaining similar differences among white males from different Army Areas (5).

This principle does not account for all of the differences between sexes which persist in the regressions on those tests on which WAF have no obvious cultural disadvantage. One additional factor causing the WAF to make better grades may be the very fact that they constitute a minority group. They are competing with men in a military situation which has been traditionally limited to men. The challenge offered by this situation plus

the fact that they are in the Air Force by choice rather than by fear of draft may make a substantial difference in the motivation of men and women.

It is possible, of course, that a bias in favor of WAF may exist in the final school grade which is used as the criterion of success throughout the study. For example, if women are neater, better spellers, better writers of essay examinations, more compliant in catering to the idiosyncracies of an instructor, etc., these things might give them an advantage on the criterion, whereas, none of these affect the score on the aptitude tests.

Finally, a certain amount of over-achievement in school is to be expected of women. The literature on sex differences shows that this is generally true throughout the school years.

References

1. Gulliksen, H., and Wilks, S.S. Regression tests for several samples. *Psychometrika*, 1950, 15, 91-114.
2. Howard, J.K., and Pickrel, E.W. *Distribution statistics and validity coefficients of Airman Classification Battery AC-1 for Negro male samples*. San Antonio, Tex.: Human Resources Research Center, Lackland Air Force Base, March 1952. (Research Note PERS 52-10.)
3. Howard, J.K., and Pickrel, E.W. *A comparative factor analysis of the Airman Classification Battery for male Negro and male white airman*. (Unclassified title.) San Antonio, Tex.: Human Resources Research Center, Lackland Air Force Base, June 1952. (Research Note PERS 52-20.) (The contents of this Note are RESTRICTED.)
4. Howard, J.K. and Pickrel, E.W. *Validation of the Airman Classification Battery for women in the Air Force*. San Antonio, Tex.: Human Resources Research Center, Lackland Air Force Base, November 1952. (Technical Report 52-5.)
5. McReynolds, Jane, and Nichols, I.A. *Comparison of performance of new airmen on the Airman Classification Battery AC-1B by Army Enlistment Area*. San Antonio, Tex.: Human Resources Research Center, Lackland Air Force Base, August 1953. (Research Bulletin 53-31.)
6. Snedecor, G.W. *Statistical methods*. (4th Ed.) Ames, Iowa: The Iowa State College Press, 1946.

Manuscript received 4 February 1953.

Appendix

Basic Statistics Used in the Study of the Prediction of Final School Grades in Selected Air Force Technical Schools from Test Scores of White Males, White WAF, and Negro Males

Introduction

Tables 4 through 14 consist of two parts. The first part of each table presents the correlations between certain predictor variables, the correlations between predictor variables and final school grade, and the means and standard deviations of each variable for each group. The second part of each table shows the regression equations using different combinations of variables for predicting school grades, the squared correlation coefficients between the predictors and school grades and the squared standard errors of estimate.

For example, Table 4 reads as follows: The first line of figures shows that for white males the regression coefficient for the aptitude index on final school grades is .18, the intercept is 2.46, the r^2 is .249, and the squared standard error of estimate is .177. The next two lines show corresponding values for white WAF and Negro male groups. The fourth line shows values when the deviation scores of the groups are pooled. The fifth line shows values when gross scores are pooled. The next group of five lines shows the same statistics for the combined predictors, aptitude index and education. Altogether, Table 4 shows four different combinations of predictors.

TABLE 4

Clerk-Typist School, 40500, First Sample

(Samples: 1965 white males, 186 white WAF, 314 Negro males; testing dates: Nov 48 - Nov 50)

Correlations of variables by groups

Variable	Group	Education	Numerical Operations II	Memory for Landmarks	Clerical Biographical Inventory	Final school grade	Mean	Standard deviation
1. Clerical Aptitude Index	White male	.58	---	---	---	.50	6.63	1.33
	White WAF	.17	---	---	---	.54	7.00	1.12
	Negro male	.45	---	---	---	.44	5.64	1.08
2. Education	White male	---	---	---	---	.44	11.22	1.29
	White WAF	---	---	---	---	.00	12.09	.50
	Negro male	---	---	---	---	.19	11.58	1.10
3. Numerical Operations II C1702B	White male	---	---	.29	---	.29	6.24	1.55
	White WAF	---	---	.23	---	.40	6.49	1.46
	Negro male	---	---	.25	---	.14	5.29	1.39
4. Memory for Landmarks BIS 10 A	White male	---	---	---	---	.30	5.30	1.87
	White WAF	---	---	---	---	.42	6.31	1.87
	Negro male	---	---	---	---	.28	4.59	1.64
5. Clerical Biographical Inventory	White male	---	---	---	---	.39	6.21	1.70
	White WAF	---	---	---	---	.19	6.97	1.27
	Negro male	---	---	---	---	.28	6.57	1.42
6. Final school grade	White male	---	---	---	---	---	3.67	.49
	White WAF	---	---	---	---	---	4.17	.50
	Negro male	---	---	---	---	---	3.44	.42

Regression weights using different combinations of variables for predicting final school grade

	Clerical Aptitude Index	Education	Numerical Operations II	Memory for Landmarks	Clerical Biographical Inventory	Intercept	R ² or r ²	SE ² _{est}
White male	.18	---	---	---	---	2.46	.249	.177
White WAF	.24	---	---	---	---	2.47	.294	.176
Negro male	.17	---	---	---	---	2.48	.194	.142
Pooled deviation	.18	---	---	---	---	---	.246	.173
Pooled gross	.20	---	---	---	---	---	.269	.186
White male	.13	.09	---	---	---	1.81	.285	.169
White WAF	.25	.09	---	---	---	3.55	.302	.174
Negro male	.17	.00	---	---	---	2.51	.194	.142
Pooled deviation	.15	.07	---	---	---	---	.268	.168
Pooled gross	.16	.07	---	---	---	---	.294	.180
White male	---	---	.07	.06	---	2.94	.137	.204
White WAF	---	---	.11	.09	---	2.89	.270	.182
Negro male	---	---	.02	.07	---	3.01	.084	.162
Pooled deviation	---	---	.07	.06	---	---	.138	.198
Pooled gross	---	---	.07	.08	---	---	.169	.212
White male	---	---	---	---	.11	2.98	.153	.200
White WAF	---	---	---	---	.08	3.64	.036	.241
Negro male	---	---	---	---	.08	2.90	.078	.163
Pooled deviation	---	---	---	---	.11	---	.135	.199
Pooled gross	---	---	---	---	.11	---	.134	.221

TABLE 5
Supply Technician School, 82600

(Samples: 414 white males, 257 white WAF, 258 Negro males; testing dates: Nov 48 - Nov 50)

Correlations of variables by groups								
Variable	Group	Education	Word Knowledge	Numerical Operations II	Clerical Biographical Inventory	Final school grade	Mean	Standard deviation
1. Clerical Aptitude Index	White male	.58	---	---	---	.53	6.15	1.42
	White WAF	.17	---	---	---	.62	6.87	1.20
	Negro male	.45	---	---	---	.38	5.40	1.00
2. Education	White male	---	---	---	---	.25	11.19	1.35
	White WAF	---	---	---	---	.24	12.13	.55
	Negro male	---	---	---	---	.25	11.50	1.13
3. Word Knowledge BI602A	White male	---	---	.35	---	.34	6.17	1.46
	White WAF	---	---	.28	---	.37	7.04	1.34
	Negro male	---	---	.36	---	.27	5.34	1.39
4. Numerical Operations II CI702B	White male	---	---	---	---	.37	5.93	1.57
	White WAF	---	---	---	---	.46	6.32	1.50
	Negro male	---	---	---	---	.18	5.16	1.34
5. Clerical Biographical Inventory	White male	---	---	---	---	.22	3.82	1.75
	White WAF	---	---	---	---	.16	6.49	1.39
	Negro male	---	---	---	---	.14	6.16	1.50
6. Final school grade	White male	---	---	---	---	---	3.15	.31
	White WAF	---	---	---	---	---	3.46	.32
	Negro male	---	---	---	---	---	3.11	.26

Regression weights using different combinations of variables
for predicting final school grade

	Clerical Aptitude Index	Education	Word Knowledge	Numerical Operations II	Clerical Biographical Inventory	Intercept	R ² of r ²	SE ² est
White male	.12	---	---	---	---	2.44	.282	.069
White WAF	.15	---	---	---	---	2.35	.378	.062
Negro male	.10	---	---	---	---	2.59	.144	.058
Pooled deviation	.12	---	---	---	---	---	.274	.065
Pooled gross	.14	---	---	---	---	---	.340	.073
White male	.13	-.02	---	---	---	2.59	.287	.068
White WAF	.16	.08	---	---	---	1.38	.399	.060
Negro male	.09	.02	---	---	---	2.39	.152	.057
Pooled deviation	.13	.00	---	---	---	---	.274	.065
Pooled gross	.13	.02	---	---	---	---	.343	.072
White male	---	---	.05	.06	---	2.50	.189	.078
White WAF	---	---	.06	.08	---	2.55	.272	.073
Negro male	---	---	.04	.02	---	2.77	.081	.062
Pooled deviation	---	---	.05	.05	---	---	.173	.073
Pooled gross	---	---	.07	.06	---	---	.242	.083
White male	---	---	---	---	.04	2.93	.047	.091
White WAF	---	---	---	---	.04	3.22	.027	.097
Negro male	---	---	---	---	.02	2.97	.020	.066
Pooled deviation	---	---	---	---	.03	---	.034	.086
Pooled gross	---	---	---	---	.05	---	.051	.105

TABLE 6

Teletype Operator School, 23700, First Sample

(Sample: 599 white males, 208 white WAF, 243 Negro males; testing dates: Nov 48 - Nov 50)

Correlations of variables by groups

Variable	Group	Education	Dial and Table Reading	Word Knowledge	Clerical Biographical Inventory	Final school grade	Mean	Standard deviation
1. Clerical Aptitude Index	White male	.58	---	---	---	.42	6.38	1.44
	White WAF	.17	---	---	---	.41	7.19	1.13
	Negro male	.45	---	---	---	.35	5.77	1.12
2. Education	White male	---	---	---	---	.51	11.26	1.33
	White WAF	---	---	---	---	.02	12.16	.65
	Negro male	---	---	---	---	.23	11.68	1.14
3. Dial and Table Reading SP622A-621A	White male	---	---	.45	---	.39	5.77	1.66
	White WAF	---	---	.33	---	.31	6.56	1.99
	Negro male	---	---	.47	---	.36	4.60	1.37
4. Word Knowledge BN02A	White male	---	---	---	---	.29	6.22	1.51
	White WAF	---	---	---	---	.25	7.10	1.26
	Negro male	---	---	---	---	.17	6.18	1.40
5. Clerical Biographical Inventory	White male	---	---	---	---	.37	6.06	1.72
	White WAF	---	---	---	---	.23	6.88	1.37
	Negro male	---	---	---	---	.29	6.44	1.38
6. Final school grade	White male	---	---	---	---	---	3.79	.47
	White WAF	---	---	---	---	---	4.07	.45
	Negro male	---	---	---	---	---	3.64	.42

Regression weights using different combinations of variables
for predicting final school grade

	Clerical Aptitude- Index	Education	Dial and Table Reading	Word Knowledge	Clerical Biographical Inventory	Intercept	R ² p/r ²	SE ² est
White male	.14	---	---	---	---	2.91	.179	.181
White WAF	.16	---	---	---	---	2.89	.169	.179
Negro male	.13	---	---	---	---	2.88	.122	.155
Pooled deviation	.14	---	---	---	---	---	.165	.173
Pooled gross	.16	---	---	---	---	---	.215	.179
White male	.12	.04	---	---	---	2.63	.186	.199
White WAF	.17	-.07	---	---	---	3.55	.178	.166
Negro male	.14	-.01	---	---	---	3.00	.123	.155
Pooled deviation	.13	.01	---	---	---	---	.166	.173
Pooled gross	.15	.01	---	---	---	---	.216	.176
White male	---	---	.11	.01	---	3.13	.154	.187
White WAF	---	---	.07	.06	---	3.18	.120	.180
Negro male	---	---	.11	.00	---	3.13	.130	.154
Pooled deviation	---	---	.10	.01	---	---	.139	.179
Pooled gross	---	---	.11	.02	---	---	.190	.184
White male	---	---	---	---	.10	3.12	.157	.191
White WAF	---	---	---	---	.09	3.44	.077	.189
Negro male	---	---	---	---	.09	3.07	.084	.162
Pooled deviation	---	---	---	---	.10	---	.115	.184
Pooled gross	---	---	---	---	.10	---	.123	.190

TABLE 7

Radio Operator School, 76601

(Samples: 91 white males, 71 white WAF, 103 Negro males; testing dates: Nov 48—Nov 50)

Correlations of variables by groups								
Variable	Group	Education	Dial and Table Reading	Electrical Information	Radio Operator Biographical Inventory	Final school grade	Mean	Standard deviation
1. Radio Operator Aptitude Index	White male	.51	---	---	---	.33	7.93	1.05
	White WAF	.12	---	---	---	.42	7.27	1.35
	Negro male	.35	---	---	---	.32	5.91	1.08
2. Education	White male	---	---	---	---	.23	11.57	1.02
	White WAF	---	---	---	---	.21	12.21	.58
	Negro male	---	---	---	---	.11	11.71	1.02
3. Dial and Table Reading BP 622A-621A	White male	---	---	.46	---	.30	7.32	1.43
	White WAF	---	---	.30	---	.54	7.18	1.56
	Negro male	---	---	.41	---	.12	4.90	1.32
4. Electrical Information DI901B	White male	---	---	---	---	.14	7.45	1.44
	White WAF	---	---	---	---	.18	5.01	1.40
	Negro male	---	---	---	---	-.01	4.95	1.28
5. Radio Operator Biographical Inventory	White male	---	---	---	---	.07	6.49	1.55
	White WAF	---	---	---	---	.09	5.73	1.50
	Negro male	---	---	---	---	.20	6.40	1.38
6. Final school grade	White male	---	---	---	---	---	3.51	.26
	White WAF	---	---	---	---	---	3.81	.34
	Negro male	---	---	---	---	---	2.50	.28

Regression weights using different combinations of variables
for predicting final school grade

	Radio Operator Aptitude Index	Education	Dial and Table Reading	Electrical Information	Radio Operator Biographical Inventory	Intercept	R ² or r ²	SE ² _{est}
White male	.08	---	---	---	---	2.85	.112	.060
White WAF	.11	---	---	---	---	3.04	.173	.098
Negro male	.08	---	---	---	---	3.01	.102	.070
Pooled deviation	.09	---	---	---	---	---	.129	.074
Pooled gross	.07	---	---	---	---	---	.102	.093
White male	.07	.02	---	---	---	2.68	.117	.060
White WAF	.10	.09	---	---	---	1.93	.198	.096
Negro male	.08	.00	---	---	---	3.01	.102	.070
Pooled deviation	.09	.02	---	---	---	---	.131	.074
Pooled gross	.06	.06	---	---	---	---	.134	.090
White male	---	---	.06	.00	---	3.11	.092	.061
White WAF	---	---	.12	.00	---	2.95	.288	.085
Negro male	---	---	.03	-.02	---	3.42	.019	.077
Pooled deviation	---	---	.07	-.01	---	---	.103	.077
Pooled gross	---	---	.09	-.05	---	---	.182	.085
White male	---	---	---	---	.01	3.43	.005	.067
White WAF	---	---	---	---	.02	3.69	.008	.118
Negro male	---	---	---	---	.04	3.24	.040	.075
Pooled deviation	---	---	---	---	.02	---	.015	.084
Pooled gross	---	---	---	---	.00	---	.000	.104

TABLE 2

Radio Operator School, 51400

(Samples: 518 white males, 59 white WAF, 115 Negro males; testing dates: Nov 48 - Nov 50)

Correlations of variables by groups

Variables	Group	Education	Arithmetic Reasoning	Aviation Information	Radio Operator Biographical Inventory	Final school grade	Mean	Standard deviation
1. Radio Operator Aptitude Index	White male	.51	---	---	---	.46	6.67	1.15
	White WAF	.12	---	---	---	.35	6.98	1.07
	Negro male	.35	---	---	---	.23	5.65	1.04
2. Education	White male	---	---	---	---	.26	11.38	1.13
	White WAF	---	---	---	---	.07	12.19	1.47
	Negro male	---	---	---	---	.26	11.42	1.16
3. Arithmetic Reasoning BI201B	White male	---	---	.47	---	.41	6.45	1.81
	White WAF	---	---	.36	---	.54	6.02	1.55
	Negro male	---	---	.35	---	.26	5.20	1.63
4. Aviation Information BI101B	White male	---	---	---	---	.41	5.77	1.69
	White WAF	---	---	---	---	.53	5.05	1.29
	Negro male	---	---	---	---	.29	4.61	1.45
5. Radio Operator Biographical Inventory	White male	---	---	---	---	.22	5.83	1.68
	White WAF	---	---	---	---	.18	5.71	1.35
	Negro male	---	---	---	---	-.04	6.09	1.46
6. Final school grade	White male	---	---	---	---	---	3.58	.30
	White WAF	---	---	---	---	---	3.70	.29
	Negro male	---	---	---	---	---	3.41	.31

Regression weights using different combinations of variables for predicting final school grade

	Radio Operator Aptitude Index	Education	Arithmetic Reasoning	Aviation Information	Radio Operator Biographical Inventory	Intercept	R ² or r ²	SE est
White male	.10	---	---	---	---	2.95	.207	.074
White WAF	.10	---	---	---	---	3.04	.120	.076
Negro male	.07	---	---	---	---	3.02	.053	.091
Pooled deviation	.09	---	---	---	---	---	.172	.077
Pooled group	.10	---	---	---	---	---	.206	.078
White male	.09	.01	---	---	---	2.88	.208	.074
White WAF	.09	.02	---	---	---	2.82	.121	.075
Negro male	.05	.06	---	---	---	2.52	.090	.087
Pooled deviation	.09	.02	---	---	---	---	.176	.077
Pooled group	.09	.02	---	---	---	---	.209	.078
White male	---	---	.05	.05	---	2.99	.228	.072
White WAF	---	---	.08	.09	---	2.80	.424	.050
Negro male	---	---	.03	.05	---	3.01	.113	.085
Pooled deviation	---	---	.05	.05	---	---	.210	.073
Pooled group	---	---	.05	.05	---	---	.234	.076
White male	---	---	---	---	.04	3.34	.047	.089
White WAF	---	---	---	---	.04	3.47	.034	.083
Negro male	---	---	---	---	-.01	3.46	.002	.090
Pooled deviation	---	---	---	---	.03	---	.030	.090
Pooled group	---	---	---	---	.03	---	.023	.096

TABLE 9
Radio Mechanic School, 75401

(Samples: 513 white males, 54 white WAF, 113 Negro males; testing dates: Nov 48—Nov 50)

Correlations of variables by groups								
Variable	Group	Education	Arithmetic Reasoning	Electrical Information	Mechanical Biographical Inventory	Final school grade	Mean	Standard deviation
1. Mechanical Aptitude Index	White male	.39	---	---	---	.51	7.46	1.29
	White WAF	.18	---	---	---	.48	6.09	1.28
	Negro male	.29	---	---	---	.53	6.04	1.10
2. Education	White male	---	---	---	---	.21	11.37	1.26
	White WAF	---	---	---	---	.08	12.39	.83
	Negro male	---	---	---	---	.08	11.73	.91
3. Arithmetic Reasoning B1201B	White male	---	---	.45	---	.47	6.79	1.60
	White WAF	---	---	.33	---	.53	6.91	1.44
	Negro male	---	---	.31	---	.45	5.85	1.59
4. Electrical Information B1901B	White male	---	---	---	---	.45	7.44	1.38
	White WAF	---	---	---	---	.55	5.52	1.38
	Negro male	---	---	---	---	.46	6.41	1.51
5. Mechanical Biographical Inventory	White male	---	---	---	---	.28	6.04	1.74
	White WAF	---	---	---	---	-.02	5.83	1.86
	Negro male	---	---	---	---	.08	5.73	1.54
6. Final school grade	White male	---	---	---	---	---	3.40	.33
	White WAF	---	---	---	---	---	3.66	.37
	Negro male	---	---	---	---	---	3.43	.32

Regression weights using different combinations of variables
for predicting final school grade

	Mechanical Aptitude Index	Education	Arithmetic Reasoning	Electrical Information	Mechanical Biographical Inventory	Intercept	R ² _{adj}	SE ² _{est}
White male	.13	---	---	---	---	2.42	.258	.083
White WAF	.14	---	---	---	---	2.81	.234	.104
Negro male	.15	---	---	---	---	2.56	.281	.074
Pooled deviation	.13	---	---	---	---	---	.258	.083
Pooled gross	.10	---	---	---	---	---	.155	.099
White male	.13	.00	---	---	---	2.39	.258	.083
White WAF	.14	.00	---	---	---	2.81	.234	.104
Negro male	.16	-.03	---	---	---	2.78	.287	.073
Pooled deviation	.13	.00	---	---	---	---	.258	.083
Pooled gross	.09	.04	---	---	---	---	.172	.097
White male	---	---	.07	.07	---	2.38	.297	.079
White WAF	---	---	.10	.11	---	2.36	.434	.077
Negro male	---	---	.07	.07	---	2.56	.315	.070
Pooled deviation	---	---	.07	.08	---	---	.309	.077
Pooled gross	---	---	.08	.04	---	---	.232	.090
White male	---	---	---	---	.05	3.07	.080	.103
White WAF	---	---	---	---	.00	3.68	.001	.135
Negro male	---	---	---	---	.02	3.34	.006	.102
Pooled deviation	---	---	---	---	.04	---	.050	.106
Pooled gross	---	---	---	---	.04	---	.045	.112

TABLE 10

Weather Observer School, 78400

(Samples: 266 white males, 94 white WAF; testing dates: Nov 48 - Nov 50)

Correlations of variables by groups

Variable	Group	Education	Arithmetic Reasoning	Dial and Table Reading	Final school grade	Mean	Standard deviation
1. Technician Specialty Aptitude Index	White male	.48	---	---	.45	7.43	1.38
	White WAF	.16	---	---	.59	7.30	.98
2. Education	White male	---	---	---	.22	11.45	1.21
	White WAF	---	---	---	.26	12.21	.56
3. Arithmetic Reasoning B1201B	White male	---	---	.63	.44	6.95	1.56
	White WAF	---	---	.56	.42	6.85	1.27
4. Dial and Table Reading BP622A-621A	White male	---	---	---	.45	6.36	1.66
	White WAF	---	---	---	.45	7.15	1.26
5. Final school grade	White male	---	---	---	---	3.18	.41
	White WAF	---	---	---	---	3.42	.36

Regression weights using different combinations of variables for predicting final school grade

	Technician Specialty Aptitude Index	Education	Arithmetic Reasoning	Dial and Table Reading	Intercept	R ² or r ²	SE ² est
White male	.13	---	---	---	2.21	.199	.132
White WAF	.22	---	---	---	1.84	.346	.085
Pooled deviation	.14	---	---	---	----	.221	.121
Pooled gross	.14	---	---	---	----	.196	.134
White male	.13	.00	---	---	2.19	.199	.132
White WAF	.21	.11	---	---	.55	.375	.081
Pooled deviation	.14	.01	---	---	----	.221	.121
Pooled gross	.13	.04	---	---	----	.207	.132
White male	---	---	.07	.07	2.26	.247	.124
White WAF	---	---	.07	.09	2.31	.241	.099
Pooled deviation	---	---	.07	.07	----	.245	.118
Pooled gross	---	---	.05	.09	----	.258	.124

TABLE 11

Clerk-typist School, 40500, Second Sample

(Samples: 1541 white males, 170 white WAF, 112 Negro males; testing dates: Dec 49 - Nov 50)

Variables	Group	Education	Dial and Table Reading	Background for Current Affairs	Clerical Biographical Inventory	Final school grade	Mean	Standard deviation
1. Clerical Aptitude Index	White male	.58	---	---	---	.47	7.14	1.29
	White WAF	.17	---	---	---	.54	6.98	1.11
	Negro male	.45	---	---	---	.34	6.29	1.03
2. Education	White male	---	---	---	---	.41	12.02	1.57
	White WAF	---	---	---	---	-.02	12.10	.49
	Negro male	---	---	---	---	.24	11.99	1.42
3. Dial and Table Reading BP622A-621A	White male	---	---	.46	.35	.43	6.20	1.70
	White WAF	---	---	.33	.16	.52	6.23	1.58
	Negro male	---	---	.44	.30	.29	4.76	1.45
4. Background for Current Affairs BI102B	White male	---	---	---	.40	.23	6.68	1.42
	White WAF	---	---	---	.13	.27	5.99	1.33
	Negro male	---	---	---	.30	.19	5.74	1.34
5. Clerical Biographical Inventory	White male	---	---	---	---	.40	6.66	1.68
	White WAF	---	---	---	---	.21	6.97	1.27
	Negro male	---	---	---	---	.31	6.94	1.45
6. Final school grade	White male	---	---	---	---	---	3.89	.57
	White WAF	---	---	---	---	---	4.17	.50
	Negro male	---	---	---	---	---	3.62	.54

Regression weights using different combinations of variables for predicting final school grade

	Clerical Aptitude Index	Education	Dial and Table Reading	Background for Current Affairs	Clerical Biographical Inventory	Intercept	R ² or r ²	SE ² est
White male	.21	---	---	---	---	2.42	.218	.255
White WAF	.24	---	---	---	---	2.48	.288	.180
Negro male	.18	---	---	---	---	2.49	.118	.259
Pooled deviation	.21	---	---	---	---	---	.217	.248
Pooled gross	.21	---	---	---	---	---	.218	.257
White male	.15	.08	---	---	---	1.88	.248	.245
White WAF	.25	-.11	---	---	---	3.74	.300	.177
Negro male	.16	.04	---	---	---	2.17	.126	.257
Pooled deviation	.16	.07	---	---	---	---	.240	.241
Pooled gross	.17	.07	---	---	---	---	.240	.250
White male	---	---	.14	.02	---	2.93	.185	.266
White WAF	---	---	.15	.04	---	2.97	.281	.182
Negro male	---	---	.10	.03	---	2.99	.083	.268
Pooled deviation	---	---	.14	.02	---	---	.186	.259
Pooled gross	---	---	.14	.01	---	---	.192	.265
White male	---	---	---	---	.14	2.98	.160	.274
White WAF	---	---	---	---	.08	3.59	.045	.240
Negro male	---	---	---	---	.11	2.83	.094	.266
Pooled deviation	---	---	---	---	.13	---	.146	.271
Pooled gross	---	---	---	---	.13	---	.143	.282
White male	---	---	.12	-.02	.10	2.62	.256	.243
White WAF	---	---	.15	.04	.05	2.68	.295	.178
Negro male	---	---	.08	.01	.09	2.58	.137	.253
Pooled deviation	---	---	.12	-.01	.10	---	.248	.259
Pooled gross	---	---	.12	-.02	.10	---	.256	.244

TABLE 12

Teletype Operator School, 23700, Second Sample

(Sample: 1074 white males, 158 white WAF, 78 Negro males; testing dates: Dec 49 - Nov 50)

Correlations of variables by groups

Variable	Group	Education	Dial and Table Reading	Memory for Landmarks	Word Knowledge	Clerical Biographical Inventory	Final school grade	Mean	Standard deviation
1. Clerical Aptitude Index	White male	.58	---	---	---	---	.45	5.98	1.18
	White WAF	.17	---	---	---	---	.42	7.27	1.08
	Negro male	.45	---	---	---	---	.42	6.38	1.11
2. Education	White male	---	---	---	---	---	.35	11.68	1.33
	White WAF	---	---	---	---	---	.09	12.13	.55
	Negro male	---	---	---	---	---	.13	11.91	1.13
3. Dial and Table Reading BP622A-621A	White male	---	---	.42	.45	---	.40	6.31	1.53
	White WAF	---	---	.37	.33	---	.32	6.51	1.60
	Negro male	---	---	.39	.47	---	.40	4.85	1.38
4. Memory for Landmarks B1510A	White male	---	---	---	.31	---	.25	5.77	1.86
	White WAF	---	---	---	.21	---	.26	6.65	1.81
	Negro male	---	---	---	.28	---	.21	5.05	1.88
5. Word Knowledge B1602A	White male	---	---	---	---	---	.22	6.78	1.35
	White WAF	---	---	---	---	---	.27	7.18	1.27
	Negro male	---	---	---	---	---	.18	6.72	1.07
6. Clerical Biographical Inventory	White male	---	---	---	---	---	.35	6.22	1.77
	White WAF	---	---	---	---	---	.27	6.99	1.35
	Negro male	---	---	---	---	---	.20	6.81	1.42
7. Final school grade	White male	---	---	---	---	---	---	3.79	.47
	White WAF	---	---	---	---	---	---	4.07	.44
	Negro male	---	---	---	---	---	---	3.63	.42

Regression weights using different combinations of variables for predicting final school grade

	Clerical Aptitude Index	Education	Dial and Table Reading	Memory for Landmarks	Word Knowledge	Clerical Biographical Inventory	Intercept	R^2 or r^2	SE^2_{est}
White male	.18	---	---	---	---	---	2.54	.202	.177
White WAF	.17	---	---	---	---	---	2.84	.175	.159
Negro male	.16	---	---	---	---	---	2.61	.176	.148
Pooled deviation	.18	---	---	---	---	---	---	.197	.173
Pooled gross	.18	---	---	---	---	---	---	.208	.179
White male	.15	.05	---	---	---	---	2.21	.213	.175
White WAF	.17	.02	---	---	---	---	2.64	.175	.159
Negro male	.17	-.03	---	---	---	---	2.85	.180	.147
Pooled deviation	.15	.04	---	---	---	---	---	.207	.171
Pooled gross	.16	.04	---	---	---	---	---	.218	.177
White male	---	---	.11	.02	---	---	2.94	.171	.184
White WAF	---	---	.07	.04	---	---	3.35	.126	.169
Negro male	---	---	.11	.01	---	---	3.00	.160	.150
Pooled deviation	---	---	.11	.03	---	---	---	.164	.180
Pooled gross	---	---	.11	.03	---	---	---	.177	.186
White male	---	---	.11	.02	.01	---	2.91	.172	.184
White WAF	---	---	.06	.04	.06	---	3.05	.150	.164
Negro male	---	---	.12	.02	-.01	---	3.04	.161	.150
Pooled deviation	---	---	.10	.02	.02	---	---	.165	.180
Pooled gross	---	---	.10	.03	.02	---	---	.179	.186
White male	---	---	---	---	---	.09	3.22	.120	.195
White WAF	---	---	---	---	---	.09	3.45	.075	.178
Negro male	---	---	---	---	---	.06	3.23	.039	.172
Pooled deviation	---	---	---	---	---	.09	---	.111	.192
Pooled gross	---	---	---	---	---	.09	---	.117	.200

TABLE 13

Photo Laboratory Technician School, 23250

(Sample: 191 white males, 45 white WAF; testing dates: Dec 49—Nov 50)

Correlations of variables by groups

Variable	Group	Education	Dial and Table Reading	Mechanical Principles	Final school grade	Mean	Standard deviation
1. Technician Specialty Aptitude Index	White male	.48	---	---	.44	7.94	1.16
	White WAF	.16	---	---	.47	7.73	.95
2. Education	White male	---	---	---	.47	11.90	1.40
	White WAF	---	---	---	.07	12.13	.45
3. Dial and Table Reading BP622A-621A	White male	---	---	.40	.45	6.92	1.41
	White WAF	---	---	.22	.40	7.40	1.37
4. Mechanical Principles BI903B	White male	---	---	---	.51	7.09	1.72
	White WAF	---	---	---	.28	5.47	1.39
5. Final school grade	White male	---	---	---	---	3.47	.31
	White WAF	---	---	---	---	3.38	.22

Regression weights using different combinations of
variables for predicting final school grade

	Technician Specialty Aptitude Index	Education	Dial and Table Reading	Mechanical Principles	Intercept	R ² or r ²	SE ² est
White male	.12	---	---	---	2.52	.196	.078
White WAF	.11	---	---	---	2.52	.223	.039
Pooled deviation	.12	---	---	---	----	.199	.070
Pooled gross	.12	---	---	---	----	.203	.071
White male	.08	.07	---	---	1.98	.281	.070
White WAF	.11	.00	---	---	2.52	.223	.039
Pooled deviation	.08	.07	---	---	----	.271	.064
Pooled gross	.09	.07	---	---	----	.268	.063
White male	---	---	.07	.07	2.51	.332	.063
White WAF	---	---	.06	.03	2.78	.195	.040
Pooled deviation	---	---	.07	.07	----	.311	.060
Pooled gross	---	---	.06	.07	----	.320	.061

TABLE 14

Airplane and Engine Mechanic school, 43151

(Samples: 789 white males, 48 Negro males; testing dates: Dec 49—Nov 50)

Correlations of variables by groups

Variable	Group	Education	General Mechanics	Mechanical Principles	Mechanical Biographical Inventory	Final school grade	Mean	Standard deviation
1. Mechanical Aptitude Index	White male	.39	---	---	---	.64	6.79	1.24
	Negro male	.29	---	---	---	.33	5.69	1.06
2. Education	White male	---	---	---	---	.33	10.74	1.46
	Negro male	---	---	---	---	.29	11.50	1.08
3. General Mechanics B1902B	White male	---	---	.48	---	.43	7.34	1.42
	Negro male	---	---	.37	---	.37	5.94	1.51
4. Mechanical Principles B1903B	White male	---	---	---	---	.41	6.78	1.58
	Negro male	---	---	---	---	.35	6.10	1.31
5. Mechanical Biographical Inventory	White male	---	---	---	---	.30	5.44	1.73
	Negro male	---	---	---	---	.05	5.69	1.52
6. Final school grade	White male	---	---	---	---	---	3.59	.39
	Negro male	---	---	---	---	---	3.47	.44

Regression weights using different combinations of variables for predicting final school grade

	Mechanical Aptitude Index	Education	General Mechanics	Mechanical Principles	Mechanical Biographical Inventory	Intercept	R ² or r	SE ² _{est}
White male	.20	---	---	---	---	2.24	.403	.090
Negro male	.14	---	---	---	---	2.70	.109	.172
Pooled deviation	.20	---	---	---	---	----	.380	.095
Pooled gross	.19	---	---	---	---	----	.380	.096
White male	.10	.03	---	---	---	2.03	.412	.089
Negro male	.11	.09	---	---	---	1.86	.150	.164
Pooled deviation	.18	.03	---	---	---	----	.391	.094
Pooled gross	.18	.03	---	---	---	----	.392	.094
White male	---	---	.08	.06	---	2.54	.241	.115
Negro male	---	---	.08	.08	---	2.48	.191	.156
Pooled deviation	---	---	.08	.07	---	----	.237	.117
Pooled gross	---	---	.08	.07	---	----	.241	.117
White male	---	---	---	---	.07	3.22	.091	.138
Negro male	---	---	---	---	.01	3.40	.002	.192
Pooled deviation	---	---	---	---	.06	----	.082	.141
Pooled gross	---	---	---	---	.06	----	.081	.142